



Influence of fuel properties on NOX emission in fluidized bed combustion of biomass

Ulusoy, Burak; Wu, Hao; Lin, Weigang; Glarborg, Peter; Dam-Johansen, Kim

Publication date:
2018

Document Version
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):
Ulusoy, B., Wu, H., Lin, W., Glarborg, P., & Dam-Johansen, K. (2018). *Influence of fuel properties on NOX emission in fluidized bed combustion of biomass*. Abstract from The 6th International Symposium on Gasification and its Application, Chengdu, Sichuan Province, China.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Influence of fuel properties on NO_x emission in fluidized bed combustion of biomass

Burak Ulusoy^{1,2*}, Hao Wu¹, Weigang Lin¹, Peter Glarborg¹, Kim Dam-Johansen¹

¹ Department of Chemical and Biochemical Engineering, Technical University of Denmark, Søltofts Plads 229, 2800 Kgs. Lyngby, Denmark;

² Sino-Danish Centre for Education and Research, 380 Huaibeizhuang, Huairou district, 101408, Beijing, China;

* Email: bulu@kt.dtu.dk

ABSTRACT

NO_x emission from fluidized bed combustion is primarily determined by a series of competing formation and reduction reactions from fuel bound nitrogen. To provide an improved understanding of NO_x emission from fluidized bed combustion of biomass, a systematic evaluation of the impact of fuel properties, including nitrogen content, mineral content, and co-combustion, on NO_x emission was investigated.

Continuous biomass combustion experiments were conducted in a lab-scale fluidized bed reactor. At otherwise similar conditions, a variety of biomass fuels, including pine wood, beech wood, straw, sunflower husk, sunflower seed, and sewage sludge, were combusted with the emission of NO_x monitored. The impact of co-combustion of selected fuels was examined at air staged and one-stage conditions. In addition, the interaction between ash forming elements and NO_x emission was investigated by combustion of washed and K-doped (KCl, K₂CO₃, and KOH) biomass.

Selected results from the experiments are shown in Figure 1 and 2. The results in Figure 1 indicate that the NO emissions from straw-sunflower seed and straw-sunflower husk co-combustion were additive, while a synergy effect was observed in the case of sewage sludge-straw co-combustion. This may be attributed to the catalytic effect of sewage sludge ash on the nitrogen chemistry. The results in Figure 2 show that the conversion of fuel nitrogen to NO decreased with the fuel nitrogen content, increased when washing the straw, and decreased slightly upon K-doping of the washed straw and raw pine wood. The largest influence of K-species was observed in the case of KCl-doped washed straw, showing a significantly lower conversion of fuel N to NO, while for the pine wood, K-doping did not change the conversion of fuel N to NO significantly.

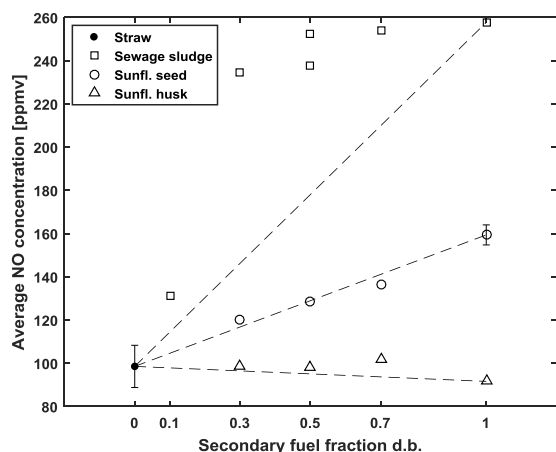


Figure 1: Average NO emission from co-combustion of primary fuel (straw) and secondary fuels (sunflower seed and husk, and sewage sludge) at 850°C with an excess air ratio 1.4-1.5 in one-stage combustion.

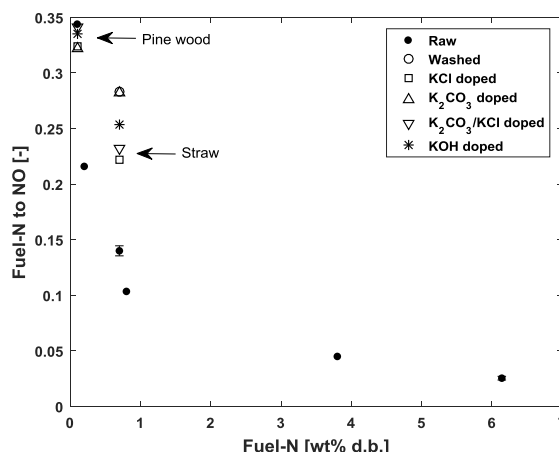


Figure 2: Conversion of fuel nitrogen to NO from combustion of washed straw and K-doped washed straw, and K-doped pine wood at 850°C with an excess air ratio 1.4-1.5 in one-stage combustion.